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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. 10/670,316 | Applicant(s) KOBAYASHI ET AL. | |
|---|---|---|---|
| | Examiner Ben Lewis | Art Unit 1795 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *12/18/07*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-6 and 22-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 22-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear to the Examiner how the fuel cell system is started up after the start switch is turned off.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Horiguchi et al. (U.S. Patent No. 6,896,985 B2).

With respect to claim 1, Horiguchi et al. disclose a fuel cell system (title) wherein, the fuel cell system comprises a fuel cell including a fuel chamber for supplying hydrogen to a hydrogen electrode and an oxygen chamber for supplying oxygen to an oxygen electrode, the fuel cell system is characterized by comprising a gas supply port for supplying a gas containing the hydrogen into the fuel chamber, a gas discharge port for discharging the gas from the fuel chamber (Col 4 lines 15-30).

Horiguchi et al. also teach that each of the cells 21 is constituted by the separators 22 forming a pair, a hydrogen electrode (anode) 24 provided at one surface side of each of the separators 22, an air electrode (cathode) 25 provided at the other surface side of each of the separators 22, and an electrolyte layer 26 of a solid electrolyte film type made of an ion exchange resin provided between the hydrogen electrode 24 and the air electrode 25. A catalyst such as platinum is held in the electrolyte of the hydrogen electrode 24 and the electrolyte of the air electrode 25. All the hydrogen electrodes 24 are electrically connected to the one current collecting plate 10c shown in FIG. 4, all the air electrodes 25 shown in FIG. 5 are electrically connected to the other current collecting plate 10c shown in FIG. 4, and the respective terminals 10e of both the collecting electrodes 10c are protruded from the stack 20 (Col 8 lines 55-67).

With respect to a discharge valve in the fuel gas discharge line, Horiguchi et al. teach that Besides, a first hydrogen release pipe H5 (fuel discharge line) communicating

with the outside air is connected to the hydrogen circulation pipe H4 between the hydrogen suction pump 82 and the hydrogen circulation electromagnetic valve 83, and the first hydrogen release pipe H5 is provided with a hydrogen exhaust electromagnetic valve 85, a hydrogen check valve 86, and a hydrogen silencer 87 from the side of the hydrogen circulation pipe H4. The first hydrogen release pipe H5, the hydrogen exhaust electromagnetic valve 85, the hydrogen check valve 86, and the inside of the hydrogen silencer 87 constitute a release passage, and an opening of the first hydrogen release pipe H5 opened to the outside air is an outside gas release port. Incidentally, switching of the circulation passage and the discharge passage is performed by the hydrogen circulation electromagnetic valve 83 and the hydrogen exhaust electromagnetic valve 85 (Col 7 lines 64-67; Col 8 lines 1-13).

With respect to hydrogen concentration sensor for detectiong hydrogen concentration in gas exiting the fuel chamber, Horiguchi et al. teach that as shown in FIG. 7, probes of the hydrogen concentration sensors C (27a to 27d) are provided in the sensor attachment holes 23i and 23j of the separator 22 positioned at the other end of the stack 20. In this way, the separators 22 having rigidity firmly hold the hydrogen concentration sensors C (27c to 27d). Besides, since the hydrogen concentration sensors C (27c to 27d) are attached to the separators 22 positioned at the other end of the fuel cell stack 1, it is possible to sufficiently detect whether or not the hydrogen gas remains in the fuel chamber 22b in the whole fuel cell stack 1, the number of the hydrogen concentration sensors C (27c to 27d) can be decreased, and the reduction in cost of the fuel cell system is realized. (Col 10 lines 10-25).

With respect to pressure regulating means for regulating a supply pressure of a flow of fuel gas supplied to the fuel chamber, Horiguchi et al. teach that the subroutine S300 of the hydrogen supply start control, first, at step S305, an output signal of the hydrogen primary pressure sensor P1 is read in, and the processing proceeds to step S310. At the step S310, it is judged whether or not the hydrogen primary pressure exceeds 10 kPa and is less than 100 kPa. Here, if YES, the processing proceeds to step S315. At the step S315, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S320. At the step S320, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S325. On the other hand, here, if NO, a subroutine S800 of restart control shown in FIG. 14 is executed (Col 11 lines 1-15).

At the step S325, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S330. At the step S330, the hydrogen suction pump 82 is turned ON, and the processing proceeds to step S335. At the step S335, an output signal of the hydrogen secondary pressure sensor P2 is read in, and the processing proceeds to step S340. At the step S340, it is judged whether or not the pressure of the fuel chamber (gas passage) 22b formed of the concave portion 22b at the separators 22 of both ends of the stack 20 is less than 10 kPa. Here, if YES, the processing proceeds to step S345 (discharge mode). Here, if NO, the processing proceeds to step S350. At the step S350, it is judged whether or not 60 seconds have

passed since the hydrogen suction pump 82 was turned ON. Here, if NO, the processing returns to the step S340 (Col 11 lines 30-42).

At the step S345, the hydrogen supply electromagnetic valve 76 is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 7 lines 1-67).

With respect to claim 2, Horiguchi et al. teach that as shown in FIG. 7, probes of the hydrogen concentration sensors C (27a to 27d) are provided in the sensor attachment holes 23i and 23j of the separator 22 positioned at the other end of the stack 20. In this way, the separators 22 having rigidity firmly hold the hydrogen concentration sensors C (27c to 27d). Besides, since the hydrogen concentration sensors C (27c to 27d) are attached to the separators 22 positioned at the other end of the fuel cell stack 1, it is possible to sufficiently detect whether or not the hydrogen gas remains in the fuel chamber 22b in the whole fuel cell stack 1, the number of the hydrogen concentration sensors C (27c to 27d) can be decreased, and the reduction in cost of the fuel cell system is realized. (Col 10 lines 10-25).

With respect to pressure regulating means for regulating a supply pressure of a flow of fuel gas supplied to the fuel chamber, Horiguchi et al. teach that the subroutine S300 of the hydrogen supply start control, first, at step S305, an output signal of the hydrogen primary pressure sensor P1 is read in, and the processing proceeds to step S310. At the step S310, it is judged whether or not the hydrogen primary pressure exceeds 10 kPa and is less than 100 kPa. Here, if YES, the processing proceeds to step S315. At the step S315, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S320. At the step S320, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S325. On the other hand, here, if NO, a subroutine S800 of restart control shown in FIG. 14 is executed (Col 11 lines 1-15).

At the step S325, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S330. At the step S330, the hydrogen suction pump 82 is turned ON, and the processing proceeds to step S335. At the step S335, an output signal of the hydrogen secondary pressure sensor P2 is read in, and the processing proceeds to step S340. At the step S340, it is judged whether or not the pressure of the fuel chamber (gas passage) 22b formed of the concave portion 22b at the separators 22 of both ends of the stack 20 is less than 10 kPa. Here, if YES, the processing proceeds to step S345 (discharge mode). Here, if NO, the processing proceeds to step S350. At the step S350, it is judged whether or not 60 seconds have

passed since the hydrogen suction pump 82 was turned ON. Here, if NO, the processing returns to the step S340 (Col 11 lines 30-42).

At the step S345, the hydrogen supply electromagnetic valve 76 (regulating valve in the fuel gas supply line) is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 7 lines 1-67).

With respect to claim 3, Horiguchi et al. discloses pressure adjusting valve 75 and a hydrogen supply electromagnetic valve 76 (switching valve) arranged in parallel (See Fig. 1).

With respect to opening and closing the switching valve, Horiguchi et al. teach that at the step S345, the hydrogen supply electromagnetic valve 76 is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than

95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 11 lines 30-42).

Horiguchi et al. also teach that at the step S365, the hydrogen exhaust electromagnetic valve 85 is closed, and the processing proceeds to step S375. At the step S375, a voltage is read in, and the processing proceeds to step S380. At the step S380, it is judged whether or not the voltage exceeds 0.95 V. Here, if YES, the processing proceeds to step S390. At the step S390, the hydrogen circulation electromagnetic valve 83 is opened, and then, a subroutine of steady control is executed (circulation mode). If NO at the step S310, if YES at the step S350 or the step S370, or if NO at the step S380, a subroutine S600 of hydrogen supply stop control shown in FIG. 12 is executed (Col 11 lines 40-55).

Horiguchi et al. also teach that when the subroutine S600 of the hydrogen supply stop control shown in FIG. 12 is executed, first, at step S605, the hydrogen supply electromagnetic valve 76 is closed, and the processing proceeds to step S610. At the step S610, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S615 (Col 12 lines 3-35).

With respect to claim 4, Horiguchi et al. teaches that as shown in FIG. 1, a code 91 is connected to both output terminals 10e (see FIG. 4) of the fuel cell assembly 10, and a motor 94(load) capable of driving a vehicle is connected to the code 91 through

an output relay 92 and an inverter 93 from the side of the fuel cell assembly 10 (Col 8 lines 30-40).

With respect to claims 5 and 6, Horiguchi et al. teaches that when a main routine of start-up control shown in FIG. 8 is executed, first, it is judged whether an ignition key (start switch) is switched ON at step S100. Here, if YES, the processing proceeds to step S200, and the subroutine S200 of air/water supply control at start-up shown in FIG. 9 is executed. Thereafter, the processing proceeds to step S300 shown in FIG. 8, and the subroutine S300 of hydrogen supply start control shown in FIG. 10 is executed. Then, the processing proceeds to step S400 shown in FIG. 8, and it is judged whether or not a voltage by power generation of the fuel cell stack 1 exceeds 0.95 V. Here, if YES, a subroutine of steady control, the details of which are omitted, is executed. At the step S100 or the step S400, if NO, a main routine S500 of stop control shown in FIG. 11 is executed (Col 10 lines 25-40). Horiguchi et al. also teach that on the other hand, after a steady operation, when the main routine of the stop control shown in FIG. 11 is executed, first, at step S510, it is judged whether or not the ignition key is turned OFF. Here, if YES, the processing proceeds to step S520. At the step S520, the output relay 92 is turned OFF, and the processing proceeds to step S530. At the step S530, the subroutine S600 of the hydrogen supply stop control shown in FIG. 12 is executed, and the processing proceeds to step S540 shown in FIG. 11. At the step S540, the subroutine S700 of the air/water supply stop control shown in FIG. 13 is executed, and the processing proceeds to step S550 shown in FIG. 11. At the step

S550, all power sources are turned OFF, and the fuel cell system is stopped. Besides, at the step S510, the fuel cell system is watching that the ignition key is turned OFF (Col 11 lines 55-67).

With respect to claim 22, Horiguchi et al. teaches that hydrogen circulation pipe H4 is connected to the other side portion (communicating with gas discharge ports 22g and 22h of the fuel chamber 22b of the fuel cell 21) of the fuel cell assembly 10, and the hydrogen circulation pipe H4 is provided with a hydrogen suction pump 82 and a hydrogen circulation electromagnetic valve 83 from the side of the fuel cell assembly 10. The hydrogen circulation pipe H4, the hydrogen suction pump 82, the hydrogen circulation electromagnetic valve 83, and the hydrogen gas-liquid separator 77 constitute a circulation passage. The hydrogen suction pump 82 constitutes a suction device. In the case where a gas in the fuel chamber 22b is circulated by the hydrogen suction pump 82, hydrogen is discharged from the gas discharge ports 22g and 22h of the fuel chamber 22b by the hydrogen suction pump 82, and is refluxed to the gas supply ports 22e and 22f of the fuel chamber 22b through the hydrogen circulation pipe H4 and through the hydrogen gas-liquid separator 77 (Col 7 lines 45-68).

With respect to pressure regulating means for regulating a supply pressure of a flow of fuel gas supplied to the fuel chamber, Horiguchi et al. teach that the subroutine S300 of the hydrogen supply start control, first, at step S305, an output signal of the hydrogen primary pressure sensor P1 is read in, and the processing proceeds to step S310. At the step S310, it is judged whether or not the hydrogen primary pressure

exceeds 10 kPa and is less than 100 kPa. Here, if YES, the processing proceeds to step S315. At the step S315, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S320. At the step S320, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S325. On the other hand, here, if NO, a subroutine S800 of restart control shown in FIG. 14 is executed (Col 11 lines 1-15).

At the step S325, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S330. At the step S330, the hydrogen suction pump 82 is turned ON, and the processing proceeds to step S335. At the step S335, an output signal of the hydrogen secondary pressure sensor P2 is read in, and the processing proceeds to step S340. At the step S340, it is judged whether or not the pressure of the fuel chamber (gas passage) 22b formed of the concave portion 22b at the separators 22 of both ends of the stack 20 is less than 10 kPa. Here, if YES, the processing proceeds to step S345 (discharge mode). Here, if NO, the processing proceeds to step S350. At the step S350, it is judged whether or not 60 seconds have passed since the hydrogen suction pump 82 was turned ON. Here, if NO, the processing returns to the step S340 (Col 11 lines 30-42).

At the step S345, the hydrogen supply electromagnetic valve 76 (regulating valve in the fuel gas supply line) is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is

judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 7 lines 1-67).

With respect to claim 23, Horiguchi et al. teaches that besides, at the time of start-up of the fuel cell, the air exists in the fuel chamber, and when the hydrogen gas as the fuel is injected in this state, the hydrogen gas and the air (oxygen gas) are mixed. It is known that deterioration of a catalyst at the side of the oxygen electrode can occur by the mixture of the hydrogen gas and the oxygen gas. Then, it is conceivable that a suction device for sucking a gas from the gas discharge port of the fuel chamber is provided, and the remaining gas is discharged to the outside of the fuel cell to prevent the mixture of the hydrogen gas and the oxygen gas (Col 1 lines 65-67; Col 2 lines 1-10).

Horiguchi et al. also teach that an outside air introduction pipe A3 opened to the outside air is connected to the hydrogen supply pipe H1 between the hydrogen secondary pressure sensor P2 and the hydrogen gas-liquid separator 77, and the outside air introduction pipe A3 is provided with a hydrogen side outside air introduction electromagnetic valve 79 (Col 7 lines 30-45). (Examiner notes that this is a teaching of the presence of air in the hydrogen passage which leads to the hydrogen chamber).

With respect to a discharge valve in the fuel gas discharge line, Horiguchi et al. teach that Besides, a first hydrogen release pipe H5 (fuel discharge line) communicating with the outside air is connected to the hydrogen circulation pipe H4 between the hydrogen suction pump 82 and the hydrogen circulation electromagnetic valve 83, and the first hydrogen release pipe H5 is provided with a hydrogen exhaust electromagnetic valve 85, a hydrogen check valve 86, and a hydrogen silencer 87 from the side of the hydrogen circulation pipe H4. The first hydrogen release pipe H5, the hydrogen exhaust electromagnetic valve 85, the hydrogen check valve 86, and the inside of the hydrogen silencer 87 constitute a release passage, and an opening of the first hydrogen release pipe H5 opened to the outside air is an outside gas release port. Incidentally, switching of the circulation passage and the discharge passage is performed by the hydrogen circulation electromagnetic valve 83 and the hydrogen exhaust electromagnetic valve 85 (Col 7 lines 64-67; Col 8 lines 1-13). (Examiner notes that since the discharge valve 85 is in communication with the fuel chamber of Horiguchi et al. then residual air is also discharged through the discharge valve 85 of Horiguchi et al.).

5. Claim 24 is rejected under 35 U.S.C. 102(e) as being anticipated by Horiguchi et al. (U.S. Patent No. 6,896,985 B2).

With respect to claim 24, Horiguchi et al. disclose a fuel cell system (title) wherein, the fuel cell system comprises a fuel cell including a fuel chamber for supplying hydrogen to a hydrogen electrode and an oxygen chamber for supplying oxygen to an

oxygen electrode, the fuel cell system is characterized by comprising a gas supply port for supplying a gas containing the hydrogen into the fuel chamber, a gas discharge port for discharging the gas from the fuel chamber (Col 4 lines 15-30).

Horiguchi et al. also teach that each of the cells 21 is constituted by the separators 22 forming a pair, a hydrogen electrode (anode) 24 provided at one surface side of each of the separators 22, an air electrode (cathode) 25 provided at the other surface side of each of the separators 22, and an electrolyte layer 26 of a solid electrolyte film type made of an ion exchange resin provided between the hydrogen electrode 24 and the air electrode 25. A catalyst such as platinum is held in the electrolyte of the hydrogen electrode 24 and the electrolyte of the air electrode 25. All the hydrogen electrodes 24 are electrically connected to the one current collecting plate 10c shown in FIG. 4, all the air electrodes 25 shown in FIG. 5 are electrically connected to the other current collecting plate 10c shown in FIG. 4, and the respective terminals 10e of both the collecting electrodes 10c are protruded from the stack 20 (Col 8 lines 55-67).

With respect to a fuel gas tank for storing a fuel gas and a fuel gas inflow line, Horiguchi et al. teach that as shown in FIG. 2, a hydrogen supply pipe H1 linked to a side of the fuel cell assembly 10 is connected to the hydrogen storing alloy tank 52, and the hydrogen supply pipe H1 (fuel gas inflow line) is provided with an MH main valve 72 near the hydrogen storing alloy tank 52 (fuel gas tank). Besides, a hydrogen filling pipe H2 and a hydrogen purge pipe H3 are connected to the hydrogen supply pipe H1, a

hydrogen filling valve 73 is connected to the hydrogen filling pipe H2, and a hydrogen purge valve 74 is connected to the hydrogen purge pipe H3 (Col 7lines 15-37).

With respect to a discharge valve in the fuel gas discharge line, Horiguchi et al. teach that Besides, a first hydrogen release pipe H5 (fuel discharge line) communicating with the outside air is connected to the hydrogen circulation pipe H4 between the hydrogen suction pump 82 and the hydrogen circulation electromagnetic valve 83, and the first hydrogen release pipe H5 is provided with a hydrogen exhaust electromagnetic valve 85, a hydrogen check valve 86, and a hydrogen silencer 87 from the side of the hydrogen circulation pipe H4. The first hydrogen release pipe H5, the hydrogen exhaust electromagnetic valve 85, the hydrogen check valve 86, and the inside of the hydrogen silencer 87 constitute a release passage, and an opening of the first hydrogen release pipe H5 opened to the outside air is an outside gas release port. Incidentally, switching of the circulation passage and the discharge passage is performed by the hydrogen circulation electromagnetic valve 83 and the hydrogen exhaust electromagnetic valve 85 (Col 7 lines 64-67; Col 8 lines 1-13).

With respect to hydrogen concentration sensor for detectiong hydrogen concentration in gas exiting the fuel chamber, Horiguchi et al. teach that as shown in FIG. 7, probes of the hydrogen concentration sensors C (27a to 27d) are provided in the sensor attachment holes 23i and 23j of the separator 22 positioned at the other end of the stack 20. In this way, the separators 22 having rigidity firmly hold the hydrogen concentration sensors C (27c to 27d). Besides, since the hydrogen concentration sensors C (27c to 27d) are attached to the separators 22 positioned at the other end of

the fuel cell stack 1, it is possible to sufficiently detect whether or not the hydrogen gas remains in the fuel chamber 22b in the whole fuel cell stack 1, the number of the hydrogen concentration sensors C (27c to 27d) can be decreased, and the reduction in cost of the fuel cell system is realized. (Col 10 lines 10-25).

With respect to pressure regulating means for regulating a supply pressure of a flow of fuel gas supplied to the fuel chamber, Horiguchi et al. teach that the subroutine S300 of the hydrogen supply start control, first, at step S305, an output signal of the hydrogen primary pressure sensor P1 is read in, and the processing proceeds to step S310. At the step S310, it is judged whether or not the hydrogen primary pressure exceeds 10 kPa and is less than 100 kPa. Here, if YES, the processing proceeds to step S315. At the step S315, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S320. At the step S320, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S325. On the other hand, here, if NO, a subroutine S800 of restart control shown in FIG. 14 is executed (Col 11 lines 1-15).

Horiguchi et al. also teach that at the step S325, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S330. At the step S330, the hydrogen suction pump 82 is turned ON, and the processing proceeds to step S335. At the step S335, an output signal of the hydrogen secondary pressure sensor P2 is read in, and the processing proceeds to step S340. At the step S340, it is judged whether or not the pressure of the fuel chamber (gas passage) 22b formed of

the concave portion 22b at the separators 22 of both ends of the stack 20 is less than 10 kPa. Here, if YES, the processing proceeds to step S345 (discharge mode). Here, if NO, the processing proceeds to step S350. At the step S350, it is judged whether or not 60 seconds have passed since the hydrogen suction pump 82 was turned ON. Here, if NO, the processing returns to the step S340 (Col 11 lines 30-42).

Horiguchi et al. also teach that at the step S345, the hydrogen supply electromagnetic valve 76 is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 7 lines 1-67).

With respect to claim 25, Horiguchi et al. teaches that a hydrogen circulation pipe H4 (loop) is connected to the other side portion (communicating with gas discharge ports 22g and 22h of the fuel chamber 22b of the fuel cell 21) of the fuel cell assembly 10, and the hydrogen circulation pipe H4 is provided with a hydrogen suction pump 82 and a hydrogen circulation electromagnetic valve 83 from the side of the fuel cell assembly 10. The hydrogen circulation pipe H4, the hydrogen suction pump 82, the

hydrogen circulation electromagnetic valve 83, and the hydrogen gas-liquid separator 77 constitute a circulation passage. The hydrogen suction pump 82 constitutes a suction device. In the case where a gas in the fuel chamber 22b is circulated by the hydrogen suction pump 82, hydrogen is discharged from the gas discharge ports 22g and 22h of the fuel chamber 22b by the hydrogen suction pump 82, and is refluxed to the gas supply ports 22e and 22f of the fuel chamber 22b through the hydrogen circulation pipe H4 and through the hydrogen gas-liquid separator 77 (Col 7 lines 45-64).

6. Claim 26 is rejected under 35 U.S.C. 102(e) as being anticipated by Horiguchi et al. (U.S. Patent No. 6,896,985 B2).

With respect to claim 26, Horiguchi et al. disclose a fuel cell system (title) wherein, the fuel cell system comprises a fuel cell including a fuel chamber for supplying hydrogen to a hydrogen electrode and an oxygen chamber for supplying oxygen to an oxygen electrode, the fuel cell system is characterized by comprising a gas supply port for supplying a gas containing the hydrogen into the fuel chamber, a gas discharge port for discharging the gas from the fuel chamber (Col 4 lines 15-30).

Horiguchi et al. also teach that each of the cells 21 is constituted by the separators 22 forming a pair, a hydrogen electrode (anode) 24 provided at one surface side of each of the separators 22, an air electrode (cathode) 25 provided at the other surface side of each of the separators 22, and an electrolyte layer 26 of a solid electrolyte film type made of an ion exchange resin provided between the hydrogen

electrode 24 and the air electrode 25. A catalyst such as platinum is held in the electrolyte of the hydrogen electrode 24 and the electrolyte of the air electrode 25. All the hydrogen electrodes 24 are electrically connected to the one current collecting plate 10c shown in FIG. 4, all the air electrodes 25 shown in FIG. 5 are electrically connected to the other current collecting plate 10c shown in FIG. 4, and the respective terminals 10e of both the collecting electrodes 10c are protruded from the stack 20 (Col 8 lines 55-67).

With respect to a discharge valve in the fuel gas discharge line, Horiguchi et al. teach that Besides, a first hydrogen release pipe H5 (fuel discharge line) communicating with the outside air is connected to the hydrogen circulation pipe H4 between the hydrogen suction pump 82 and the hydrogen circulation electromagnetic valve 83, and the first hydrogen release pipe H5 is provided with a hydrogen exhaust electromagnetic valve 85, a hydrogen check valve 86, and a hydrogen silencer 87 from the side of the hydrogen circulation pipe H4. The first hydrogen release pipe H5, the hydrogen exhaust electromagnetic valve 85, the hydrogen check valve 86, and the inside of the hydrogen silencer 87 constitute a release passage, and an opening of the first hydrogen release pipe H5 opened to the outside air is an outside gas release port. Incidentally, switching of the circulation passage and the discharge passage is performed by the hydrogen circulation electromagnetic valve 83 and the hydrogen exhaust electromagnetic valve 85 (Col 7 lines 64-67; Col 8 lines 1-13).

With respect to hydrogen concentration sensor for detectiong hydrogen concentration in gas exiting the fuel chamber, Horiguchi et al. teach that as shown in

FIG. 7, probes of the hydrogen concentration sensors C (27a to 27d) are provided in the sensor attachment holes 23i and 23j of the separator 22 positioned at the other end of the stack 20. In this way, the separators 22 having rigidity firmly hold the hydrogen concentration sensors C (27c to 27d). Besides, since the hydrogen concentration sensors C (27c to 27d) are attached to the separators 22 positioned at the other end of the fuel cell stack 1, it is possible to sufficiently detect whether or not the hydrogen gas remains in the fuel chamber 22b in the whole fuel cell stack 1, the number of the hydrogen concentration sensors C (27c to 27d) can be decreased, and the reduction in cost of the fuel cell system is realized. (Col 10 lines 10-25).

With respect to pressure regulating a supply pressure of a flow of fuel gas supplied to the fuel chamber, Horiguchi et al. teach that the subroutine S300 of the hydrogen supply start control, first, at step S305, an output signal of the hydrogen primary pressure sensor P1 is read in, and the processing proceeds to step S310. At the step S310, it is judged whether or not the hydrogen primary pressure exceeds 10 kPa and is less than 100 kPa. Here, if YES, the processing proceeds to step S315. At the step S315, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S320. At the step S320, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S325. On the other hand, here, if NO, a subroutine S800 of restart control shown in FIG. 14 is executed (Col 11 lines 1-15).

At the step S325, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S330. At the step S330, the hydrogen suction pump 82 is turned ON, and the processing proceeds to step S335. At the step S335, an output signal of the hydrogen secondary pressure sensor P2 is read in, and the processing proceeds to step S340. At the step S340, it is judged whether or not the pressure of the fuel chamber (gas passage) 22b formed of the concave portion 22b at the separators 22 of both ends of the stack 20 is less than 10 kPa. Here, if YES, the processing proceeds to step S345 (discharge mode). Here, if NO, the processing proceeds to step S350. At the step S350, it is judged whether or not 60 seconds have passed since the hydrogen suction pump 82 was turned ON. Here, if NO, the processing returns to the step S340 (Col 11 lines 30-42).

At the step S345, the hydrogen supply electromagnetic valve 76 is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 7 lines 1-67).

With respect to claim 27 and 28, Horiguchi et al. teaches that when a main routine of start-up control shown in FIG. 8 is executed, first, it is judged whether an ignition key (start switch) is switched ON at step S100. Here, if YES, the processing proceeds to step S200, and the subroutine S200 of air/water supply control at start-up shown in FIG. 9 is executed. Thereafter, the processing proceeds to step S300 shown in FIG. 8, and the subroutine S300 of hydrogen supply start control shown in FIG. 10 is executed. Then, the processing proceeds to step S400 shown in FIG. 8, and it is judged whether or not a voltage by power generation of the fuel cell stack 1 exceeds 0.95 V. Here, if YES, a subroutine of steady control, the details of which are omitted, is executed. At the step S100 or the step S400, if NO, a main routine S500 of stop control shown in FIG. 11 is executed (Col 10 lines 25-40). Horiguchi et al. also teach that on the other hand, after a steady operation, when the main routine of the stop control shown in FIG. 11 is executed, first, at step S510, it is judged whether or not the ignition key is turned OFF. Here, if YES, the processing proceeds to step S520. At the step S520, the output relay 92 is turned OFF, and the processing proceeds to step S530. At the step S530, the subroutine S600 of the hydrogen supply stop control shown in FIG. 12 is executed, and the processing proceeds to step S540 shown in FIG. 11. At the step S540, the subroutine S700 of the air/water supply stop control shown in FIG. 13 is executed, and the processing proceeds to step S550 shown in FIG. 11. At the step S550, all power sources are turned OFF, and the fuel cell system is stopped. Besides, at the step S510, the fuel cell system is watching that the ignition key is turned OFF (Col 11 lines 55-67).

With respect to claim 29, Horiguchi et al. teaches that the subroutine S300 of the hydrogen supply start control, first, at step S305, an output signal of the hydrogen primary pressure sensor P1 is read in, and the processing proceeds to step S310. At the step S310, it is judged whether or not the hydrogen primary pressure exceeds 10 kPa and is less than 100 kPa. Here, if YES, the processing proceeds to step S315. At the step S315, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S320. At the step S320, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S325. On the other hand, here, if NO, a subroutine S800 of restart control shown in FIG. 14 is executed (Col 11 lines 1-15).

At the step S325, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S330. At the step S330, the hydrogen suction pump 82 is turned ON, and the processing proceeds to step S335. At the step S335, an output signal of the hydrogen secondary pressure sensor P2 is read in, and the processing proceeds to step S340. At the step S340, it is judged whether or not the pressure of the fuel chamber (gas passage) 22b formed of the concave portion 22b at the separators 22 of both ends of the stack 20 is less than 10 kPa. Here, if YES, the processing proceeds to step S345 (discharge mode). Here, if NO, the processing proceeds to step S350. At the step S350, it is judged whether or not 60 seconds have

passed since the hydrogen suction pump 82 was turned ON. Here, if NO, the processing returns to the step S340 (Col 11 lines 30-42).

At the step S345, the hydrogen supply electromagnetic valve 76 is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 7 lines 1-67).

Horiguchi et al. teaches that Incidentally, in the above embodiment, although the hydrogen concentration sensor C is adopted as the concentration detection means, an oxygen concentration sensor can be adopted instead of the hydrogen concentration sensor C (Col 13 lines 49-67).

## *Claim Rejections - 35 USC § 103*

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horiguchi et al. (U.S. Patent No. 6,896,985 B2).

With respect to claims 30 and 31, Horiguchi et al. disclose a fuel cell system (title) in paragraph 2 above. Horiguchi et al. does not specifically teach wherein the pressure regulating means reduces the supply of pressure of the flow of fuel gas to the second pressure and closes the discharge valve only when the detected oxygen concentration equal to or less than a predetermined oxygen concentration. However, Horiguchi et al. teaches that the subroutine S300 of the hydrogen supply start control, first, at step S305, an output signal of the hydrogen primary pressure sensor P1 is read in, and the processing proceeds to step S310. At the step S310, it is judged whether or not the hydrogen primary pressure exceeds 10 kPa and is less than 100 kPa. Here, if YES, the processing proceeds to step S315. At the step S315, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S320. At the step S320, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S325. On the other hand, here, if NO, a subroutine S800 of restart control shown in FIG. 14 is executed (Col 11 lines 1-15).

At the step S325, the hydrogen exhaust electromagnetic valve 85 is opened, and the processing proceeds to step S330. At the step S330, the hydrogen suction pump 82 is turned ON, and the processing proceeds to step S335. At the step S335, an

output signal of the hydrogen secondary pressure sensor P2 is read in, and the processing proceeds to step S340. At the step S340, it is judged whether or not the pressure of the fuel chamber (gas passage) 22b formed of the concave portion 22b at the separators 22 of both ends of the stack 20 is less than 10 kPa. Here, if YES, the processing proceeds to step S345 (discharge mode). Here, if NO, the processing proceeds to step S350. At the step S350, it is judged whether or not 60 seconds have passed since the hydrogen suction pump 82 was turned ON. Here, if NO, the processing returns to the step S340 (Col 11 lines 30-42).

At the step S345, the hydrogen supply electromagnetic valve 76 is opened, and the processing proceeds to step S355 (supply mode). At the step S355, output signals of the hydrogen concentration sensors C (27c to 27d) are read in, and the processing proceeds to step S360. At the step S360, it is judged whether or not the hydrogen concentration by all the hydrogen concentration sensors C (27c to 27d) is less than 95%. Here, if YES, the processing proceeds to step S365. Here, if NO, the processing proceeds to step S370. At the step S370, it is judged whether or not 30 seconds have passed since the hydrogen supply electromagnetic valve 76 was opened. Here, if NO, the processing returns to the step S355 (Col 7 lines 1-67).

Horiguchi et al. also teaches that incidentally, in the above embodiment, although the hydrogen concentration sensor C is adopted as the concentration detection means, an oxygen concentration sensor can be adopted instead of the hydrogen concentration sensor C (Col 13 lines 49-67).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to regulate the supply pressure of hydrogen based on the sensed oxygen concentration because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp, in this case, to regulation of the supply pressure of hydrogen based on the sensed oxygen concentration. Ex Parte Smith, 83 USPQ.2d 1509, 1518-19 (BPAI, 2007) (citing KSR v. Teleflex, 127 S.Ct. 1727, 1740, 82 USPQ2d 1385, 1396 (2007)).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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